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THE

BOBBIN & BEAKER

STUDENT PUBLICATION OF THE CLEMSON TEXTILE SCHOOL

VOL. 5 MARCH, 1947 NO. 2

IN THIS ISSUE . . .

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The
BOBBIN and BEAKER

Official Student Publication
Clemson Textile School

Vol. V MARCH, 1947 No. 2

In This Issue

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The Bobbin and Beaker

Organized in November 1939 by Iota Chapter of Phi Psi Fraternity, and published and distributed without charge three times during the school year by students of the Clemson College School of Textiles.

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Policy—

The views and opinions expressed in all guest articles are those of the writers themselves, and must not be construed to represent the views and opinions of the Editors of this magazine or of the Faculty of the Clemson College School of Textiles.

Comment—

We feel that the January issue has taken us "over the hump". This first issue in almost four years has been as much a challenge to us as it has been a job to be done. We hope that we have met the challenge. We realize the magnitude of the job yet to be done, but we feel that, with the continued support of all, it can be done.

The assistance given us already has in large measure made it possible for the resumption of publication. This help will be needed at all times if a creditable magazine is to be had. The staff appreciates fully the spirit of co-operation which has been shown by the faculty, friends, and advertisers.

Thus far the critics have been more than generous. Your valued comments on all matters are welcomed, and careful consideration of all criticisms and suggestions for improvement will be given. Largely through your suggestions, we will be able to correct our faults and to make both the necessary and desirable changes.

Adviser—

Professor Robert K. Eaton, Head of the Carding and Spinning Department, is now serving as Faculty Adviser. His able assistance and valuable suggestions have meant much to the staff in its preparation of material for this issue.

Professor Eaton succeeds M. D. Moore, Jr., who recently accepted a position in industry. The staff wishes him much success at his new post. His absence from the campus will be felt by all.

Circulation—

There are still many alumni who are not receiving their copies of *The Bobbin and Beaker.* We are anxious to have their names on the permanent mailing list. Also there have been many changes of address during the past few years. Please send your name and correct address to the Circulation Manager. Others desiring to receive the magazine may do so by addressing: Circulation Manager, *The Bobbin and Beaker*, Clemson College, Clemson, S. C.

RECENT GRADUATES

Nineteen students of the School of Textiles received the degree of Bachelor of Science in Textile Engineering at graduation exercises held in the College Chapel Sunday, February 9, 1947.

Dean Brown listed these graduates, with their home addresses and places of employment, where known, as follows:

James C. Austell, Jr., of Blacksburg, S. C., now with Burlington Mills, Burlington, N. C.; Joseph D. Blalock of Camden; John L. Brady of Spartanburg, now with Drayton Mills, Spartanburg; Thomas E. Christenberry, Jr., of Greenville, now with Victor Monaghan Mills, Greenville; Joseph W. Davis of Columbia; Walter M. Greer of Greenville, now with Texize, Inc., Greenville; Wilbur B. Greyard, Jr., of Greenville, now with Judson Mills, Greenville; Henry A. Josey of Anderson, now with Springs Cotton Mills, Lancaster; Charles M. Joye of Columbia; David C. Lee of Whitmire, now with Abbeville Mills, Abbeville, S. C.

Also William M. Littlejohn of Clemson, now with Abbeville Mills, Abbeville, S. C.; James B. McDonald of Bolton, Georgia; Carl F. Merritt of Piedmont; Joseph B. Rhame of Sumter, now with Dunean Mills, Greenville; Frank C. Rogers, Jr., of Spartanburg, now Instructor in Textiles, Clemson School of Textiles; Carl W. Sinclair of Greenville; Thomas A. Turner, Jr., of Pocahontas, Miss., now with Magnolia Cotton Mills, Magnolia, Ark.; David W. Walker of Anderson, now with the Central Industrial Engineering Group of the Deering Millikin chain; and William M. Washington of Honea Path, now with Watts Mills, Laurens, S. C.

Thomas E. Christenberry, Jr., Joseph W. Davis, Walter M. Greer, and David M. Walker were graduated with honor.

There were no graduates in the new curricula adopted by the school last fall, and there were no graduates in Textile Chemistry. The February graduating class was the largest mid-year class since pre-war days.

Clyde A. Murchison of Anderson has completed all of the work needed for graduation and will receive his degree in Textile Engineering in June. He is now with the Central Industrial Engineering Group of the Deering Milliken chain.

AATCC

Six seniors majoring in Textile Chemistry were admitted as student members of the American Association of Textile Chemists and Colorists early this year. They are L. Tigler, E. T. McIlwain, J. K. Waits, R. F. Sherriff, W. E. Broadwell, and D. A. Watson. They were sponsored by Professor Joseph Lindsay, Jr., Head of the Department of Textile Chemistry and Dyeing.

Several of the new members were present at the meeting of the Piedmont Section on January 25 at the Poinsett Hotel, Greenville, S. C.

Graduate Work Needed In Textiles

By DR. ROBERT F. POOLE
President, Clemson College

For a long time graduates of textile schools were accepted reluctantly in textile manufacturing plants. The situation was caused by various factors. In recent years the graduate of textile schools has made a place for himself in the industry. He has ably sold his services by achieving much in a role of progress. Perhaps his contributions have brought about a broader vision in the textile field. There are demands for chemists, economists, botanists with knowledge of fibers, and physicists who hold the doctor's degree. These demands for men of greater knowledge, a definitely meritorious value, mean that the graduate with a bachelor's degree must do about three more years of hard study if he wishes to reach the top in textile positions.

A large number of our brilliant and dynamic graduates shun the opportunities offered by graduate work and the necessary three years of intensive study do not appeal to them. They have not comprehended the importance of graduate work. Now that the demands are specific, as has long been the case for one preparing for medicine, it may be possible to interest young men who possess aptitudes, wisdom, and vision to make the necessary preparation which is requisite for top positions in the textile industry and its many allied fields.

The leadership in the textile industry is not mistaken in its needs. A well trained man is an asset to any organization and at any time may greatly improve the values of the industry. Executives are finding that many of the men who do seek advanced education not only possess more potential values than the graduate with only a bachelor's degree, but in employing such graduate he takes less chance than with those not interested in mastery of principles.

For fifty-three years, the life of Clemson College, an effort has been made to strengthen the courses leading to the bachelor's degree. That satisfactory goal has been reached in many curricula and the way is now clear for this same effort to advance into the larger fields of education offered by graduate work.

The complexities in the textile industry, involving the use of cotton cellulose, wood cellulose, flax, silk, wool, and synthetic fibers, make the field for textile education broad in its scope. More intimate knowledge of cotton cellulose, its blending qualities with fibers, ways of maintaining its strength, and the establishment of standard qualities is a vital matter that seems to be necessary for maintaining progressiveness in the cotton textile industry. It is inevitable that other fibers will replace cotton in many fabrics but well educated men who possess vision, intuition, and the "know how" may continue to do the things that will keep cotton cellulose at and above its present usefulness so that it may compete favorably with those other fibers that are encroaching on its uses of the past.

The problems of the textile industry start with the sowing of the seed in the soil and stop at the end of the durability of the manufactured product. High class products throughout the many processes and uses are what everybody wants. They cannot be had by wishful thinking and by the outmoded methods and processes of the past. Men must be educated to solve the problems all along the line. I believe a strong graduate program can occupy a large place in fulfilling the educational needs but the graduate school as such is worthless unless it can attract the graduates with the bachelor's degree who possess qualities of wisdom, vision, initiative, and at least a certain love of textiles.

In his Will, a document possessing great foresightedness, Mr. Clemson speaks of a "high seminary of learning" and the useful application of the sciences and arts. The language of the Will tends to convey a meaning which projects the need for close fellowship between college and industry to the end that both shall be richly rewarded. I can visualize now how the graduate program in the years ahead may easily take Clemson to the textile manufacturers and bring the textile manufacturers to Clemson because of similarity of interests, aims, and objectives.

How may one approach graduate work in the field of textiles? Since we are dealing with carbohydrates, proteins, and synthetic chemicals, and since solving the prob-

(*See page* 17)

Human Engineering

By M. D. HEATON

I have heard a number of men, approaching that glad day of graduation from Clemson say, "I've never even been inside of a mill and I wonder just how I will like the mill." No one can tell a man whether he will be happy and successful in his work in the mill or not, because of the many factors involved. However, I would like to discuss one of these factors which will have great bearing on the subject. This factor is the thing called "human relationship" or "human engineering".

In college we study a little sociology, history, literature, and so on, which have some connection with this subject, but this article is an attempt to deal with what will be called "getting along with people", leadership, personality, and other terms, out in the mill. Many mill men consider this to be the most important part of the requirements for a successful career in textiles.

When a man undertakes a job for the first time, he is going to be on trial from all sides. The workers and management alike will be sizing him up and forming opinions about him. The new man is in the spotlight as much as the bride at her wedding, and, unless he is a self-confident sort of person, will be just about as nervous. It will probably help him to know that they will not expect him to be a superman and more than likely will not expect as much from him as he will from himself. The more interest the new man has in his job, the less time he will have to worry about the impression he is making. As a result he will probably be less likely to feel conspicuous.

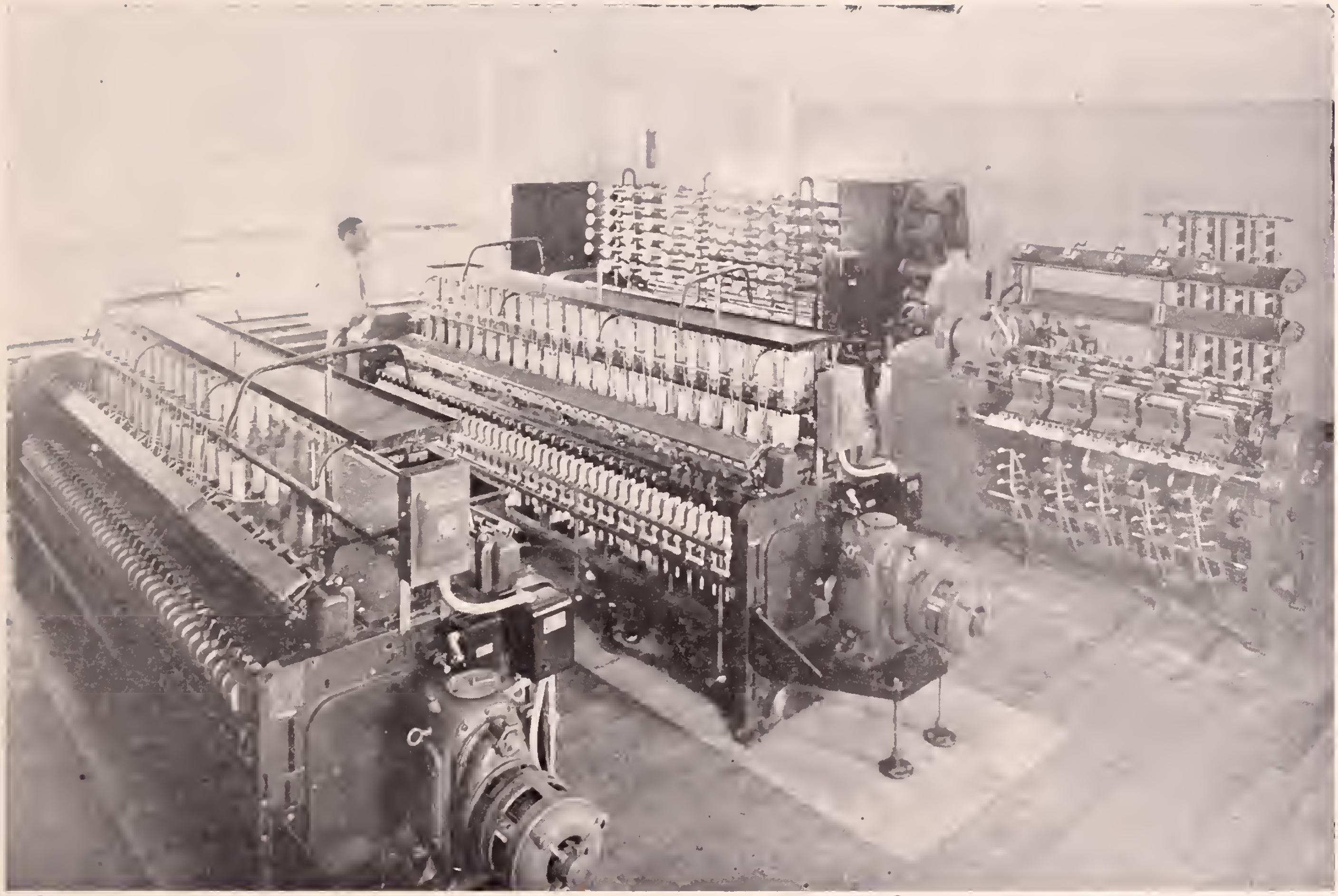
If a man is to have a period of training in the plant in which he is to work, before he actually takes over the job, he will find the task of "breaking-in" much easier than if he begins working regularly from the start. By this means he will get to know the workers, the particulars of the job, and will get some idea of how to go about the duties of the job.

One of the first things he will need to do is to secure the confidence and cooperation of the workers. I place this as "first" because once the new man has gained this confidence and cooperation, the workers will go to almost any limits to help him. On the other hand, if he antagonizes them, they can put the proverbial thousand and one petty interferences in his way. It is to any new man's advantage to think out a definite program for winning the confidence and well wishes of the workers. Some help along this line might be gained by reading such books as Dale Carnegie's HOW TO WIN FRIENDS AND INFLUENCE PEOPLE.

In dealing with the people in the mill, a man will have to deal with many different types of people. His preconceived ideas that the workers all belong to some special class must be discarded. As in other groups, each of them is an individual and must be treated accordingly. They will range from the most illiterate to the high school graduate, and in some cases to those with college degrees—working as operatives in the mill. One thing that should be kept in mind is the fact that, even though the old fixer or other worker may not express himself in the best of English, there is still much that may be learned from him. He must get the worker's ideas on such things as increasing efficiency, bettering working conditions, improving quality, and one gets in addition the interest of the worker because he will feel that there is importance in the job he is doing. While he is learning from the worker, it is also important that the new man teach his associates anything he can that will be of help to them.

One of the greatest aids to friendly relations in the mill is the taking part in the community activities of the mill. If possible, the new man should live in the community, go to church there, and support all projects carried out by the workers. Most workers are intensely loyal to their athletic teams, their schools, and any other thing which they feel is their own. By taking part in the community life, a new man can let the people know that he is on their side. A man should always strive to get things done with as little friction as possible. If he always tries to put himself in the other man's position, he can have far greater understanding of the problem. One should always remember that the workers will respond to courteous, fair and just treatment just as quickly as he himself does.

With the resolve to always be the gentleman he admires others for being, there is a successful career ahead for the Clemson textile graduate.



General view of the spinning section in the Government Spinning Laboratory in the Clemson textile school.

Government Spinning Laboratory

By A. M. HAND

In 1921 the United States Department of Agriculture, in cooperation with Clemson College, established a cotton spinning laboratory in the Textile School at Clemson. It has been maintained here continuously since then, except for a brief interval between 1921 and 1923 when the laboratory was moved to N. C. State College at Raleigh.

This laboratory is under the guidance of Mr. J. M. Cook, who is assisted by a staff of nineteen persons, of whom fifteen are technical and professional and four are clerical and statistical workers. Mr. Cook has been stationed here since 1930 and was named head of the laboratory in August 1936. The only similar laboratory is maintained in College Station, Texas, in cooperation with the Agricultural and Mechanical College of Texas. The South Carolina laboratory is known as the Clemson Laboratory and the one at College Station is known as the Texas Laboratory.

The following types of work are carried on at the Clemson Laboratory:

Cotton samples are sent from various Federal and State experimental stations throughout the Cotton Belt, in connection with the Federal-State cotton breeding and improvement programs, to be tested for their fiber and spinning qualities. Tests are made to determine the fiber length, fiber fineness, fiber maturity, fiber strength, and fiber structures, as well as spinning qualities. The purposes of these studies are to determine the comparative spinning performance of leading varieties or of new strains of cotton having commercial promise, grown at different

Table 1—Fiber Laboratory Test Results for Some Varieties of Upland Cotton Grown at Specified Locations, Crop of 1945a

Place of Growth and Variety	Length (Fibrograph) Upper half mean	Mean	Uniformity Ratio	Fineness (weight per inch of fiber)	Mature Fibers	Fiber tensile strength b	X-Ray Angle
	Inches	Inches	Index	Micrograms	Per cent	1,000 lbs. per sq. in.	Degrees
Statesville, N. C. (c)							
Coker 100-8*	1.05	0.80	76	3.9	76	73	38
Coker 100-9	1.05	.77	73	3.8	75	76	35
Coker 100 Wilt-4	1.09	.86	79	4.2	78	74	37
Coker 100 Wilt-5	1.05	.84	80	4.0	77	74	38
Coker 200-5	1.08	.84	78	4.5	84	76	38
Deltapine 14 (060)	1.02	.79	77	3.9	76	73	40
Stonewilt 5	1.03	.84	82	4.4	82	71	39
White Gold 4	1.05	.82	78	4.0	69	76	35
Florence, S. C. (d)							
Coker 100-8*	1.10	.82	75	3.9	76	70	40
Coker 100-9	1.06	.77	73	4.0	79	70	38
Coker 100 Wilt-4*	1.07	.84	79	4.5	79	67	40
Coker 100 Wilt-5*	1.05	.81	77	4.4	79	68	38
Coker 100 Staple 1	1.09	.80	73	4.1	76	67	41
Coker 4 in 1-7*	1.06	.79	75	4.4	84	71	39
Deltapine 14 (060)	1.05	.81	77	4.3	81	69	40
Stonewilt 5	1.03	.79	77	4.5	84	68	41
Experiment, Ga. (e)							
Acala 1517	1.05	.80	76	3.9	76	90	30
Coker 100-9	.97	.68	70	3.9	77	81	34
Coker 100 Wilt-5	.98	.72	73	3.8	67	78	36
Deltapine 14 (060)	1.04	.77	74	4.2	77	76	37
Empire 2910*	1.00	.71	71	4.2	71	80	31
Stoneville 2B (8275)*	.99	.73	74	4.2	76	80	31
Stoneville 62 Dunlavy	.92	.71	77	4.4	75	77	32
Stonewilt 5	.98	.73	74	4.0	76	74	36
Knoxville, Tenn. (f)							
Coker 100 Wilt-5	1.08	.87	80	4.4	80	74	38
Deltapine 14 (060)	1.04	.82	79	4.2	81	76	38
Empire 7-8921	1.09	.86	79	4.2	74	83	33
Empire 2910	1.10	.87	79	4.2	74	82	32
Stoneville 2B (8275)	1.06	.83	78	4.2	76	79	33
Stoneville 2C (7303)	1.09	.85	78	4.0	74	80	34
Calhoun, La. (g)							
Bobshaw 1-819*	1.04	.76	73	4.4	77	78	36
Coker 100 Wilt-5*	1.09	.83	76	4.4	80	73	38
Dixie Triumph 366-789	1.12	.85	76	4.4	82	77	36
Dixie Triumph 366-030	1.03	.82	80	4.7	76	68	40
Stonewilt 5	1.08	.85	79	4.4	80	70	39
College Station, Tex. (h) (Main Farm)							
Deltapine 14 (060)	.97	.73	75	4.3	82	82	31
Hibred	.75	.60	80	5.5	77	82	31
Macha	.82	.65	79	4.4	70	82	32
Rogers Acala 111*	.91	.68	75	3.8	74	86	26
Mebane (Buckallew)	.89	.69	78	5.2	80	71	34
Safford, Ariz. (i)							
Acala 1517*	1.08	.80	74	3.6	79	89	31
Acala P 18-C*	1.02	.76	75	3.7	75	76	41
Acala 1517 Wilt	1.05	.75	71	3.4	69	91	32
Santan Acala	1.07	.80	75	4.1	82	72	41

(a) Taken from Tables in "Results of Fiber and Spinning Tests for Some Varieties of Cotton Grown in the United States, Crop of 1945," Cotton Branch, Production and Marketing Administration, USDA.

(b) Converted from Pressley index according to the following formula: Tensil strength equals (10.8116 x Pressley index - 0.12).

(c) Plantings were made the first of May. Growing conditions during May and June were about normal. Excessive rain in July resulted in more than normal weed growth. August was ideal for cotton development. Eleven inches of rainfall in September delayed opening about 2 weeks. The weather during the harvesting period, October 1 to November 10, was generally favorable.

(d) The weather was warm during the latter part of March and the first of April. During the latter part of April and through the first of June, the weather was generally unfavorable for plant growth and development. Heavy infestation of boll weevil occurred during July and August; the damage, however, was light. The cotton was harvested near the middle of September, after having been exposed to considerable rain during the early part of the month.

(e) Spring storms destroyed the first plantings, which were made on April 21, and caused extremely poor stands from the second plantings, made on May 22. Plant growth and development were late and poor. The crop was harvested late in October following an extensive period of rainy weather.

(f) Weather and soil conditions at planting time (April 23) were favorable. Immediately following the planting period, however, the weather and soil were cool and wet. Stands were badly depleted and growth development was poor. The weather during June was generally dry and unseasonably cool. Tarnished plant bugs prevented normal fruiting of the crop.

(g) The weather conditions were generally unfavorable for plant growth and development throughout the year. Cool and damp weather prevailed during the germination and seedling periods. Excessive rains during the fruiting period favored rapid propagation

Table 2—Commercial classification, manufacturing performance, and carded yarn quality results for some varieties of upland cotton grown at specified locations, crop of 1945

Place of growth and variety 1	Grade (1) 2	Picker and card waste 3	Naps per 100 sq. in. of card web 4	Staple length: Classer's (1) 5	Staple length: Equivalent (2) 6	Yarn strength (lbs. per 120-yd. skein): 22s 7	36s 8	Third count spun (3) 9	Yarn appearance grade (4): 22s 10	36s 11	Third count spun (5) 12
		Percent	Number	Inches	Inches						
Statesville, N. C.											
Coker 100-8 *	GM	6.7	12	1	1 3-32	121	64	42(50s)	Bx	Cx	Cx
Coker 100-9	GM	7.0	12	1	1 1-8	125	66	44(50s)	Bx	B	Cx
Coker 100 Wilt-4	GM	7.9	5	1	1 1-16	118	64	42(50s)	Bx	Cx	Cx
Coker 100 Wilt-5	GM	6.9	8	1	1 1-8	122	66	44(50s)	B	B	B
Coker 200-5	GM	7.0	6	1	1 1-32	114	61	39(50s)	Bx	B	B
Deltapine 14 (060)	GM	5.8	6	1	1 3-32	122	65	43(50s)	Bx	B	B
Stonewilt 5	GM	6.2	8	1	1 1-16	118	64	42(50s)	Bx	B	Cx
White Gold 4	GM	5.8	10	1	1 3-32	121	64	42(50s)	B	Cx	Cx
Florence, S. C.											
Coker 100-8 *	M	8.5	10	1 1-32	15-16	101	54	26(60s)	Bx	Cx	Cx
Coker 100-9	M	9.4	8	1 1-32	15-16	100	53	26(60s)	Bx	Cx	Cx
Coker 100 Wilt-4 *	M	8.5	8	1	7-8	95	51	33(50s)	Bx	B	Cx
Coker 100 Wilt-5 *	M	12.1	14	1 1-32	7-8	95	50	24(60s)	Bx	Cx	Cx
Coker 100 Staple 1	SLM	8.7	10	1 1-32	15-16	101	53	27(60s)	B	Cx	Cx
Coker 4 in 1-7 *	M	8.6	11	1 1-32	29-32	102	54	25(60s)	Bx	Cx	Cx
Deltapine 14 (060)	M	8.5	11	1 1-32	15-16	105	56	27(60s)	B	B	Cx
Stonewilt 5	SLM	9.3	11	1	29-32	98	52	34(50s)	Bx	B	Cx
Experiment, Ga.											
Acala 1517	M lt sp	8.3	17	1 1-32	1 5-32	125	68	35(60s)	B	Cx	Cx
Coker 100-9	M lt sp	9.2	16	1 1-32	1	110	57	28(60s)	B	Cx	Cx
Coker 100 Wilt-5	SLM	9.2	16	1 1-32	1	113	60	29(60s)	B	Cx	Cx
Deltapine 14 (060)	SLM	7.7	11	1	1	113	59	39(50s)	Bx	Cx	Cx
Empire 2910 *	M lt sp	9.0	13	1 1-32	1	110	59	28(60s)	B	Cx	Cx
Stoneville 2B (8275) *	M lt sp	8.3	12	1	1	110	58	40(50s)	Bx	B	Cx
Stoneville 62 (Dunlavy)	M lt sp	8.6	11	1	15-16	103	54	35(50s)	Bx	Cx	Cx
Stonewilt 5	M lt sp	9.5	18	1 1-32	31-32	108	58	27(60s)	Bx	Cx	Cx
Knoxville, Tenn.											
Coker 100 Wilt 5	M	8.5	10	1 1-16	1 3-32	124	65	33(60s)	Bx	Bx	Cx
Deltapine 14 (060)	SM	7.6	12	1 1-32	1 1-8	126	67	34(60s)	Bx	Bx	B
Empire 7-8921	M	8.5	12	1 1-32	1 1-8	126	66	34(60s)	Bx	B	Cx
Empire 2910	M	8.3	14	1 1-32	1 5-32	130	68	35(60s)	Bx	B	Cx
Stoneville 2B (8275)	SM	8.3	12	1 1-32	1 1-8	121	66	34(60s)	Bx	B	Cx
Stoneville 2C (7303)	M	8.7	10	1 1-32	1 1-16	118	64	32(60s)	Bx	B	B
Calhoun, La.											
Bobshaw 1-819 *	SLM	8.9	17	1	15-16	105	56	36(50s)	Bx	B	B
Coker 100 Wilt-5 *	SLM	9.1	23	1 1-32	31-32	106	57	30(60s)	B	B	Cx
Coker 4 in 1-7	SLMbr	7.7	19	1 1-16	1	107	58	29(60s)	B	Cx	C
Miller 06 *	SLM	8.2	9	1 1-32	7-8	96	51	25(60s)	B	B	Cx
Stonewilt 5	M	8.0	19	1 1-32	31-32	105	57	30(60s)	Bx	B	Cx
College Station, Tex. (Main Farm)											
Deltapine 14 (060)	SLM	9.2	24	1	1 1-32	110	62	40(50s)	Bx	Bx	B
Hibred	SLM	9.3	10	13-16	13-16	84	50	146(14s)	Bx	Bx	Bx
Macha	SLM	9.2	12	7-8	7-8	94	50	39(44s)	Bx	Bx	B
Rogers Acala 111 *	SLM	8.2	23	31-32	1 1-16	116	65	41(50s)	Bx	B	Cx
Mebane (Buckellew)	SLM	8.2	19	31-32	13-16	91	48	30(50s)	Bx	B	B
Safford, Ariz.											
Acala 1517 *	SLM EW	9.2	30	1 1-16	1 7-32	133	72	38(60s)	Cx	C	C
Acala P 18-C *	SLM EW	11.5	22	1 1-32	31-32	105	56	28(60s)	Cx	Cx	C
Acala 1517 Wilt	SLM EW	9.8	21	1 1-32	1 1-8	126	67	35(60s)	Cx	C	C
Santan, Acala	M EW	9.6	28	1 1-32	1	108	57	29(60s)	Cx	C	C

(1) Classer's designation based on Official Cotton Standards.
(2) Average for three counts of yarn.
(3) Figures in parentheses indicate yarn count spun.
(4) In accordance with yarn appearance standards of American Society for Testing Materials.
(5) See column 9 and footnote 3.
X Indicates plus.

of boll weevils. Precipitation during the harvesting season was above normal.

(h) Ample moisture in the soil at planting time aided germination and a good stand was obtained. During May, June, and July, rainfall was above normal but was well-distributed throughout the period. The crop did not suffer at any time during the blooming period from lack of moisture. Boll weevil infestation was above normal. Continued rains during late August and early part of September caused considerable weather damage.

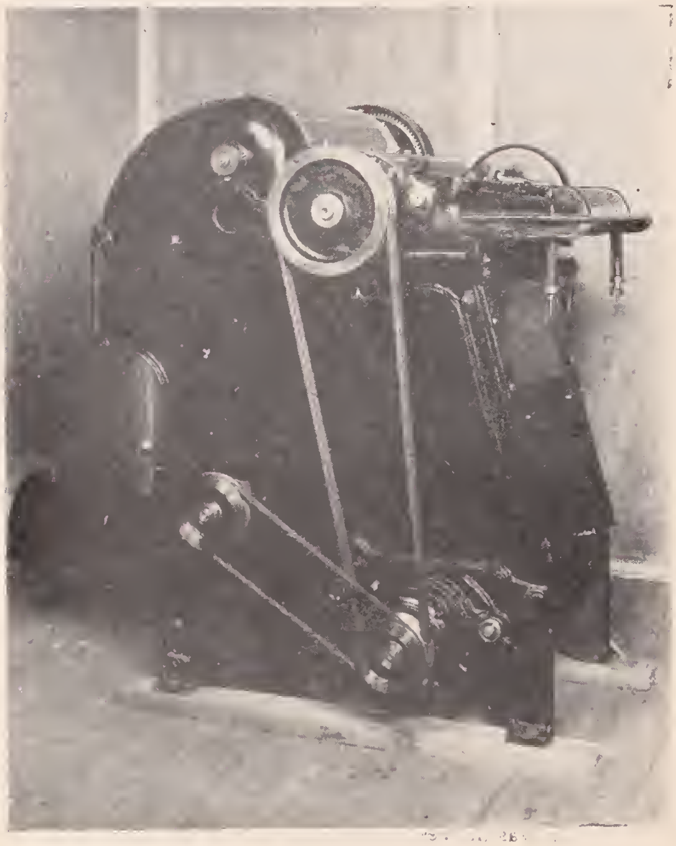
(i) During the early spring and summer months temperatures were near normal. The first irrigation was applied about the middle of July. Relatively small water supply limited the irrigations to less than optimum. Unusually hot weather in September caused the crop to mature early. Stinkbug damage was severe. Wilt was also severe but less than normal. The crop was harvested under favorable weather conditions.

* Indicates that variety or strain is in commercial production in that general area.

locations throughout the Cotton Belt; and to indicate the effects induced by different seasonal, soil, and climatic conditions on the spinning and fiber properties of cotton.

Other major phases of work being carried on are these: (1) Service testing is offered for cotton growers, breeders, mills, and others. This is an increasingly important function, which makes it possible for them to submit cotton and cotton products to the laboratory for testing—on a fee basis. The charges made are in proportion to the amount of work involved in the process needed. (2) Tests on cotton (Staple and Grade) standards are conducted on both fiber and spinning to hold them in line insofar as they are related to each other. (3) Research work to determine the importance of various fiber properties to the spinning qualities of cotton. (4) Research and investigation towards developing instruments and techniques for testing.

The accompanying tables include the results of fiber and spinning tests on some of the leading varieties of cotton grown during the 1945 season at different Federal and State experimental stations. These tests were conducted in the laboratories of the Cotton Branch of the Production and Marketing Administration, USDA, which are operated in cooperation with Clemson Agricultural College and the Bureau of Plant Industry, Soils, and Agricultural Engineering. Other cottons were also tested at the College Station, Texas, laboratory, in cooperation with the same Department of Agriculture agencies. These results are valuable to mills, cotton breeders and growers in deciding what kinds of cotton are best suited for their purposes.



The Shirley Analyser is used in determining the amount of foreign matter in lint.

Most of the textile machinery used in tests at the Clemson laboratory is of regular commercial design with minor modifications in order to adapt the equipment to special requirements of the test work. Rigidly specified humidity conditions are necessary in making most of the manufacturing tests and these conditions are made possible by automatic-controlled humidifiers. When tests are made on yarn, cord and fabric, temperature and relative humidity are controlled to "standard" conditions—70 degrees F. and 65 per cent R. H.

The yarn and fabric testing laboratories have the most modern devices available for textile testing. They include the following kinds of apparatus: tensile strength testers for yarn in single strand and skein forms, testers for tire cord and fabrics, automatic yarn reel, motor-driven rotary racks for conditioning specimens, fabric bursting strength tester, yarn numbering quadrants, several twist counters, sliver evenness tester, roving numbering quadrants, roving tester, electric oven for the determination of moisture regain, stroboscope for studying the action of travelers, fliers and other fast moving parts of textile machinery, several types of tachometers, complete equipment for making cotton fiber strength, maturity, and fineness measurements, microscopes, chemical balances and various other important pieces of equipment. The Shirley Analyser and one automatic single strand tester were imported from England. The former is used for determining the amount of foreign matter in lint.

The laboratory also has a sample slasher that was developed by the Clemson Laboratory staff. Use of this slasher allows the slashing and weaving of quantities of yarn as small as one and a quarter pounds and the determination of manufacturing performance of different cottons from the results obtained from only five pound samples. This laboratory slasher may be of interest to—and could be put to use by—concerns that manufacture a large number of samples of cloth for commercial purposes, as well as to laboratories that are faced with the problem of weaving fabrics from small lots of yarn.

Mr. Cook has described the machine as consisting of "a narrow steel frame which is approximately 36 inches high, a convenient working height, with the guide rolls, combs, squeeze rollers, and leasing rollers mounted on top of this frame. The size box and drying chamber with its coils, fan, and electric switches, are attached to the frame between the floor and the top. On the T-shaped front of the machine is mounted a movable carriage, equipped with rollers from side to side on the frame. The bearings for the loom beam and a variable speed drive along with the required bearings and shafts for driving the squeeze rolls, are mounted on the carriage.

(*See page* 20)

Antique Equipment Presented to School

Mr. John B. Humbert (center) explains to President Poole (left) and Dean Brown how he acquired the antique spinning wheel in the center foreground.

Dr. R. F. Poole, President of Clemson College, always has had an appreciation for antiques and has been particularly interested in the establishment of a textile museum at Clemson. Mr. John B. Humbert, Manager and Assistant Treasurer of the Utica and Mohawk Cotton Mills, Inc., Seneca Division, Seneca, S. C., presented to the textile school on March 3 a valuable collection of antique textile equipment which he had been assembling for many years.

Mr. Humbert, a graduate of Wofford College, has been prominent in the textile industry in South Carolina for almost 50 years, and has always been interested in Clemson's School of Textiles. He has been actively interested in the Boy Scouts and in young men, many of whom he has helped in their efforts to obtain college educations. His principal hobby has been the collection of antique textile machinery.

Dr. Hugh M. Brown, Dean of the School of Textiles, has stated that the school is most fortunate in receiving Mr. Humbert's collection and feels that it will serve as a valuable stimulus to the students in the school. Dean Brown says that a room in the textile building will be set aside for the school's museum and that he hopes that additional equipment will be donated by other interested manufacturers.

The equipment included in Mr. Humbert's gift to the school consists of a hand loom, a rare "combination textile machine," several spinning wheels, a reel, a warper, and a scale model of a bale presser.

A description and the history of this equipment is given as follows:

The hand loom which stands about six and a half feet high, five feet long, and five feet wide, and a stool for the operator were made entirely by hand in 1860 by Mr. James Floyd of Liberty, South Carolina. The loom was originally owned by Mrs. Nancy Boggs Taylor, later married to William Dodd of Calhoun, South Carolina, who operated it in making blankets, table cloths, counterpanes, towels, and various other kinds of cloth needed to make clothing for the family. The loom was purchased by Mr. Humbert from one of Mrs. Dodd's children in 1928. The loom was made almost entirely of wood, the only metal parts being the ends of the warp beam. There are two double harness. Reeds for the loom were made by splicing thin strips of ordinary bamboo and securing them between strips of wood tied together with cord. Several hand-made shuttles and bobbins were included with the loom, which is still in a usable state.

One of the large spinning wheels has the same history as the hand loom and was used in connection with the loom. The spinning wheel was also hand made.

The "combination textile machine" is one of three known to exist in the United States. A similar machine is displayed in "The Hermitage", home of Andrew Jackson near Nashville, Tennessee. Mr. W. R. Armstrong, a prominent textile executive of Gastonia, North Carolina, exhibited the third one at the Southern Textile Exposition, held in Greenville, South Carolina, about fifteen years ago. It was on display in the Universal Winding Company's booth. It is said of the Armstrong machine which is similar in every detail that it was probably built in the United States, and that it was approximately a hundred and fifty years old.

(*See page 24*)

Progress in Bleaching

PROF. JOSEPH LINDSAY, JR.
Head of the Department of Textile Chemistry and Dyeing
Clemson College

Prof. Lindsay at work in Textile School Research Chemistry Laboratory.

The old time bleacher took the winter off! Although this statement may not be true for all old timers, it pretty well pictures the pace of world textile processing in general and bleaching in particular up to 150 or so years ago. When we contrast this picture with one of our modern bleacheries—thousands of yards of cloth processed per day—cloth moving, always moving, day and night, year in and year out, we realize that the changes in methods have been tremendous, and that few of our bleachers spent their winters in Florida.

Looking back over the years, we find that there are no definite records of what the ancients employed as bleaching agents, but we do find that the Chinese, along with others of the Far East, were bleaching, or at least whitening, cloth several thousand years ago. Their methods were brought to the Near East by the Arabs and Phoenicians and from there it spread throughout Europe.

We find records of the art of whitening of materials during the heyday of the Near East in hieroglyphics in the tombs of the Pharaohs. The scenes depict the continuous systems of that day, and each step was a man performing his part of the job. The first man, the saturator perhaps, rubbing the cloth in an unknown liquid in a vessel; the second man, the extractor, shaking the piece and wringing it out; the third, the framer, stretching it and hanging it in the air. How long it must hang there before it became white enough is not recorded, but it is known that exposure to sunlight, air and moisture was the only bleaching method worthy of note until almost the beginning of the nineteenth century.

During the three centuries preceding 1800, bleaching throughout Europe has been described by the historians, and seems to be a close approximation of the story of the hieroglyphics. During this period bleaching was confined almost entirely to linen goods. The other major fibers, wool, silk and cotton, were considered naturally white enough without special treatment, but the high pectin content of flax made bleaching essential in obtaining the beautiful linens which were so popular in those years.

Throughout this period, since no chemical process as we know it was available, the whitening of fabrics depended upon their exposure in the damp state to the atmosphere. This required a tremendous amount of hand labor as well as large investments in land on which to expose the goods. Carefully prepared grass areas were used as exposure plots, and the keepers of these beautiful greens or lawns were important cogs in the bleaching process. The plots must be properly sloping for drainage, free from irregularities, and as clear as possible of small stones, sticks or other trash which might become caught on the goods and cause damage later.

This "grassing" or "crofting" treatment was only a part of the whitening process. The cloth must first be treated in alkali, "bucked or bawked," and each piece, perhaps fifty or sixty yards, was then conducted out to the exposure plots by two men. There it was fastened down, and while so placed constantly sprinkled with water during the day to keep it moist for proper reaction. Dew acted as the dampening agent at night. Because the grassing areas were unenclosed, guards were necessary at night to prevent damage to the valuable goods by stray animals as well as to stop some "interested party" from taking a couple of pieces home for his personal use. Very stringent laws were in force to protect the goods during this exposure period.

After the required number of days, or weeks, of exposure, the pieces were escorted back into the dye room and given additional alkaline treatment. These steps of alkaline boiling and outside exposure were repeated as many times as the hand bleacher considered necessary to give the proper degree of whiteness. The number of treatments depended in some degree on the type of goods, and the length of exposure varied with the season of the year and the weather conditions during a particular period. March to October was by far the best period and the short, cold, foggy days of the remaining months were very unsatisfactory. We can see therefore that the bleacher of those days might well take the winter off.

For over two hundred years, until the middle of the eighteenth century, when bleaching became a national industry in Ireland, the North Sea region of the Netherlands around Haarlem was acknowledged the best location for grassing. Linens made in many other countries were sent into Holland, and upon their return, the finished goods were reportedly sold as "Dutch linens" to take advantage of the superior reputation of these Haarlem bleachers. An idea of the great amount of time involved may be seen from the fact that a shipper of grey linen from no farther away than the British Isles did not expect the bleached goods back before six months. Our grey mills would love this delivery today!

An important step in the whitening by the grassing method was the "sour" or treatment of the goods after the alkaline boils with sour milk. The lactic acid of the milk served to make the impurities of the linen easier to remove. It was necessary to steep the cloth for several days, but since the milk was cheap and easily available, millions of gallons were reported to have been used over the years for this purpose. The simple substitution of dilute sulfuric acid, at a somewhat later period, shortened this time of steeping from four to five days to only one day.

Although this slow grass method of bleaching persists in a small way in some sections of the world, the commercial processes of today had begun to take shape almost two hundred years ago. Scheele, a Swiss, discovered chlorine in 1774 and Tennant succeeded in manufacturing bleaching powder from lime and gaseous chlorine around the turn of that century. This bleaching powder was rapidly adopted for the bleaching of cotton and linen.

With the perfection of proper machinery, we Americans began to come into the picture and the so-called "American Process" became recognized in the 1830s. It was very similar to the full chlorine type bleach of today, and required singeing, steeping in bleaching powder solution, "chemic", and souring again. In our present day processes the most important changes have been the substitution of caustic soda for lime, and the use of sulfur dioxide gas in solution as a sour and anti-chlor. Chlorine in such forms as sodium hypochlorite or chlorite is also very commonly used to replace the older chemic. This method continued to be almost the only large scale process for cellulose fibers until well up into the present century, when peroxides began seriously to come into the picture.

Looking back again, we find that the climb of peroxides into large commercial use was nothing like as rapid as that of bleaching powder. Hydrogen peroxide was discovered as far back as 1808, but commercial use of peroxides was still almost unknown a century later, as we may see from the following extracts taken from a Textile American editorial of March 1905. This editorial is prophesying a bright future for sodium peroxide and states among other things:

"The days are drawing rapidly near when our many troubles due to faulty and imperfect bleaching are over . . . this will have come about when our mills will have relegated to the dark ages the sulphur house, the bisulphite vat, and the 'chemic', and instead of that will have installed beautiful white tubs into which goes nothing but nature's own bleaching agent, ozone, or, in tangible form, Peroxide of Sodium . . . It is understood that this chemical (Peroxide of Sodium, not so very long ago a laboratory curiosity) is now manufactured in such quantities as to allow its sale at a price which permits it to compete with lime and sulphur . . . as chemistry has found a way of collecting and concentrating those natural forces which in infinite dilution accomplished the grass bleach and allows them to be applied in their concentrated form with an enormous saving in time, and with actually the same effect." It was at least eight or ten years after this announcement that peroxides really began to be used in large quantities for bleaching purposes.

Peroxides have of course one big advantage over chlorine type bleaches, they may be used for all fibers, whereas the chlorine derivatives are under normal conditions unsatisfactory except for the cellulose fibers. This advantage is not so important however in view of the fact that there is only a comparatively small yardage of materials bleached which is not made from cellulose fibers. Each year approximately 250 million pounds of cotton go into sheets and pillowcases alone, articles which are almost universally bleached before use. Cotton goods are therefore by far the major field of interest for the seller of bleaching agents.

The method most largely used for bleaching cotton with peroxides has been along the same lines as the older chlorine bleach. It involved the use of kiers and there-

(*See page* 17)

Textile Scholarships at Clemson

By L. H. BUCHANAN

Today as never before, the textile industry recognizes the importance of higher education for the personnel of that industry. This is evidenced by the fact that there were no textile scholarships available before the war, whereas at the present time there are two active scholarship funds set up at Clemson by textile organizations. One of these was recently established by the Pendleton Manufacturing Company, Pendleton, South Carolina, and the other (several years earlier) by S. Slater and Sons, Inc., of Slater, South Carolina.

The Slater Scholarship Fund was established by Mr. S. Slater in the summer of 1942. His purpose in creating this fund was the advancement of education in the Slater community.

The Slater family has been interested in education as far back as the Textile Pioneer in America, Samuel Slater. "Samuel Slater is also credited with commencing a pioneer Sunday-School which he opened at first in his own home. In its beginnings this school was not intended primarily for religious instruction. He introduced the system of Sunday-School instruction which he had seen in operation in the mills in England. The Slater Schools were continued for a number of years. These New England Sunday-Schools were subsequently taken under the care and patronage of the different religious organizations.

"Samuel Slater's interest in schools also extended to the common day schools. He helped with the creation and maintenance of day schools in all of the villages in which he established mills." The Slater family is still carrying out the promotion of education in textile communities.

The Slater fund set up at Clemson is provided by Mr. H. N. Slater III, and the scholarships are given to qualified graduates of the local Slater-Marietta School. A similar fund has also been set up for girls to attend Furman University, Greenville.

There are no obligations attached to the scholarship fund established by Mr. Slater. The student may take any course he desires, with the scholarship fund serving as an aid. It provides for a full four year course.

Each year two boys and two girls are chosen from the graduating class of the Slater-Marietta School by the faculty and the scholarship committee, headed by Mr. Frank Cook of the Slater organization. These students are chosen on the basis of their scholastic ability, character and qualities of leadership. Financial need is also taken into consideration by the Scholarship Committee. The four scholarships are awarded each year at the graduating exercises.

The war years saw the program somewhat disrupted, but there has been one student to graduate, who entered Clemson under the scholarship plan. F. J. Brannon, Jr., was graduated with the class of 1946 with a B. S. degree in Textile Engineering Since that time he has been employed by S. Slater and Sons as assistant production manager.

Students who are currently enrolled at Clemson and who have scholarships from Slater are: Lawrence H. Buchanan, Senior Textile Engineering student; James E. Barnett, Sophomore Pre-Medicine student; William R. Vassey, Freshman Arts and Sciences student; and Clelle Buchanan; Freshman Arts and Sciences. Buchanan and Barnett are veterans who have returned to school after spending some time in the armed forces.

The Pendleton Manufacturing Company has set up a fund at Clemson similar to the Slater fund. This scholarship, which provides funds for one day cadet's expenses, including tuition, fees, and uniform charges, was established last year. The first student to enter Clemson on this scholarship is Billy Ray Adams, Freshman Textile Manufacturing student from Pendleton. The scholarship stipulates that the recipient must be enrolled in a textile course.

(*See page* 19)

Textile Opportunities

By H. R. VALERIUS, JR.

There are a great many opportunities in the textile industry for graduates of Clemson College. Not only is there a great demand within the cotton textile industry in this and surrounding states, but there are other constantly increasing forms of textile manufacturing. One of these is the woolen and worsted textile producing industry.

Woolen manufacturing in the South has been very limited until a relatively few years ago. It is, however, a potentially large field for this section and is increasing at the present time. Probably the most recent woolen mill is the Deering Milliken woolen spinning plant at McCormick, South Carolina. The building has 116,000 square feet of floor space, and will contain 20,000 spindles when the remainder of the machinery is installed. After the wool is spun, it is sent to Abbeville for dyeing, and then to the Deering Milliken mill at Johnston to be woven. There are other woolen mills in South Carolina, and plans for many more new ones when the present scarcity of building materials and textile machinery no longer exists.

The South has for many years been the center of the cotton textile industry in the United States. The greatest increase in the number of manufacturing establishments in the South has taken place since 1900, and the value of the products has increased proportionately during the same period. It stands to reason that, if it is more beneficial for the cotton textile industry to move to the Southern states, these same advantages can be utilized by the woolen and worsted industry. At present the trend is toward building up woolen production in the South, with the manufacturers now looking to the Southern states. Just as South Carolina was among the leaders in the development of the cotton textile industry in this part of the country, it is now a potential leader in the establishment of woolen mills.

It should be of interest to textile students to know that South Carolina offers many possibilities for their talents outside of the cotton industry. It is hoped that this article will acquaint the student and others with some of the factors that have influenced—and will continue to influence—the trend of woolen and worsted manufacturing to expand in the South. Woolen and worsted mills now operating in the South are not located in crowded areas. The South offers room for expansion, pure wholesome air, and the elimination of slums and smoke which accompany all large industrial areas.

At the time the textile industry was intorduced into the United States, the Northern states, with their abundant supply of power and skilled industrial workers naturally became the textile industrial centers. The South was still the agricultural center of the nation. Thus New England became the location of the bulk of the new industry, and because many firms began in that section they have continued to operate there. It is a costly proposition for a manufacturing plant to move. However, if the change of location will substantially reduce production costs, both the manufacturer and the consumer will profit. It has been said that all industries move from one location to another to take advantage of cheaper production costs.

Southern industrialization got its start after the Civil War when the large plantations were made into smaller farms and the slave labor system was abolished. The South had found it necessary to diversify its economy. The introduction of the cotton textile industry was successful and thrived in the midst of the existing cotton growing industry. In 1880 four Southern states, Georgia, South Carolina, North Carolina and Virginia, produced only 2.6 per cent of this country's cotton textiles. About sixty years later, these four states were producing 53 per cent. Cotton textile production in the Northern states had been reduced from 85.4 per cent to 28.4 per cent during that same period.

Many of the established woolen textile mills are very old from the standpoint of both construction and equipment. In 1937, the largest supplier of looms for the manufacture of worsted and woolen products, Crompton and

(*See page* 22)

LOCATION OF TEXTILE ESTABLISHMENTS

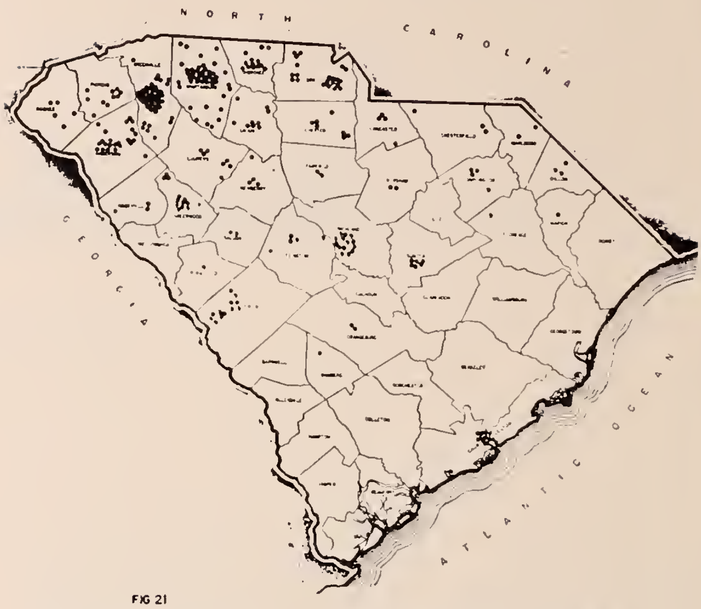


FIG 21

SOUTH CAROLINA
STATE PLANNING BOARD

EACH DOT REPRESENTS ONE ESTABLISHMENT
LOCATIONS SHOWN ARE APPROXIMATE

Cotton Textile Industry In South Carolina

Just as the first World War clearly demonstrated to the United States the need for self-sufficiency in the fields of chemicals, dyes, and other materials, so half a century earlier had the Civil War shown to the South the necessity of an economy founded upon manufacturing as well as agriculture. Since that realization has become evident, the South as a whole has made rapid strides, which seem destined to continue for a long time to come.

Having lived from the land since the earliest settlement days, the South was reluctant to relinquish its way of life. Its people had already lost the war, their slaves, and often their worldly possessions. Tradition surrendered only when the cold facts were known: cotton and rice in storage in Southern ports could not be converted during the war into finished goods from other regions. Munitions, ordnance, shipyards, transportation and clothing were not available, and these essentials of war could not be supplied. In such fashion, then, did industrial growth begin its southward trek.

In several Southern states, the expansion of industry was dominated by the growth of the cotton textile industry. South Carolina was no exception, having pioneered the mass movement of that industry from the New England region. Today this industry, turning out more than a quarter of a billion dollars worth of manufactured products, dominates the scene.

Not until 1876, when the state government was returned to the people, was there any opportunity for industry to make any headway. Prior to this time, textile manufacturing was relatively low. It might be said that the first textile concern in the state was a factory for spinning silk, opened in Charles Town in 1766, when the state was producing silk in small quantities. Two years later a silk filature was built at Purrysburg.

The establishment of the early manufacturing concerns was motivated by the desire to obtain some degree of independence from the high tariffs existing at that time. Several plants were brought into being around 1830 when the tariff controversy was being aired. These ventures were none too successful for various reasons. The tariff of 1842 revived the interest in industrial independence, and establishments once more sprang into being. The textile industry witnessed some expansion at this time, with the value of manufactured cotton goods increasing between 1840 and 1850 from $359,000 to $748,338, more than

COTTON SPINDLES AND LOOMS

Year	South Carolina Spindles	South Carolina Looms	United States Spindles	United States Looms	S. C. % of U. S. Total Spindles
1840	16,355		2,284,631		0.7
1860	30,890	525	5,235,727	126,313	0.6
1870	34,940	745	7,132,415	157,310	0.5
1880	82,334	1,676	10,653,435	227,383	0.8
1890	332,784	8,546	14,188,103	324,866	2.4
1900	1,431,349	42,663	19,008,352	455,752	7.5
1904	2,864,092		23,155,613	559,781	12.4
1909	3,754,251	96,281	27,425,608	665,652	13.7
1914	4,552,048	111,189	30,915,489	677,920	14.7
1919	4,949,225	116,932	33,795,681	693,064	14.6
1927	5,436,078	128,617	35,300,895	654,401	15.4
1929	5,603,910	132,772	36,360,633	659,823	15.4
1935	5,821,464	139,905	29,297,057	517,652	19.9
1940	5,518,724		24,749,578		22.3
1945	5,314,302		23,127,798		23.0

hundred per cent increase in a decade. During this same period, capital investment in manufactures rose from $3,216,970 to $6,931,756. Although several lines of manufacture were established at this time, diversification was not complete, and the state remained under the dominance of cotton cultivation until after the Civil War.

Not until Gregg's success at his Graniteville mill in 1845 was textile manufacturing considered as feasible in the South. A third of a century later, however, all of the textile mills in the state were located in six counties, and from 1840 to 1860 the number of spindles in the state increased from 16,355 to 30,890, representing in both years less than one per cent of the nation's total.

These meager beginnings represented no more than a small wedge into the ancient plantation system, which was vigorously opposed to any industrial expansion at all.

The features of the state which favored industrial expansion had been enumerated in 1850 by J. H. Hammond in an address before the South Carolina Institute, at its First Annual Fair. He argued for the development of manufacturing industries by citing such advantages as low costs due to low wages, a plentiful power supply, and good transportation. In addition, manufacturing would provide an opportunity for investment of capital which was going elsewhere, and would furnish employment to many who, at that time, were not earning a decent living. Raw materials, particularly cotton, would be available at a minimum cost; the state would benefit from the income derived from manufacturing; and the price of cotton goods consumed in this section would be reduced through the elimination of transportation costs, duties, and middleman's profits. Despite these advantages, the state possessed thirty years later less than one per cent of the nation's spindles.

A NEW ERA

In the early years following the Civil War, only 8141 persons, less than one per cent of the total population, were earning a living through employment in manufacturing concerns. At the same time, the value of manufactured products was less than ten million dollars. Not until 1880 could any noticeable increases be seen as a result of the movement which began in the late 1870s. These increases were for the most part in the cotton textile industry, and from that time to the present that industry has served as a good index to the overall manufacturing progress of the state.

South Carolina's cry of "Eureka!" was heard—not in 1849—but in 1880. The boom, begun a few years earlier, was in full swing during the next decade. So strong was the desire for the establishment of cotton mills that their promotion took on the character of a campaign, with success measured in terms of mills actually established. The organization of mills was motivated not only by the desire of individuals seeking profits, but also by the desire to aid the community by affording employment to a large number of people. The desire for new industry was so strong that towns would vie with each other in building mills. At least half of the mills established during this period were community enterprises, and often the commencement of operation of a mill was marked by a ceremony. As a result of this stimulation by communities, many of the mills established were located, not at water power sites, but within the limits of cities or towns, or even in the middle of cotton fields. Later, when the community spirit was largely replaced by the commercial spirit, mills were established in unincorporated places because of lower taxes. This condition is still in evidence today, with many large mill communities still unincorporated.

While the New England textile centers continued to grow during the eighties, the Southern states set the pace in the expansion of cotton textile manufacturing. They are still setting the pace today. In South Carolina, between 1880 and 1890, the number of spindles more than quadrupled, increasing from 82,334 (0.8% of the nation's total) to 332,784 (2.4% of the nation's total). The number of looms increased over this period from 1676 to 8546. Cotton consumption in the South almost tripled, while it increased in New England by but 33 per cent. It was also during this decade that the mills began locating almost exclusively in the Piedmont section of the state, and today three Piedmont counties each may boast of more textile concerns than all of the coastal plain counties. No less than twenty-six textile mills were established between 1880 and 1890.

South Carolina's cotton textile industry continued to expand after the eighties, with forty-seven new plants being established by the end of the century. During this last decade before 1900, the number of spindles and looms was again quadrupled, and the state's share of the nation's total spindles jumped to 7.5 per cent. Also, by 1900, the South was consuming 1,523,168 bales of cotton, almost forty per cent of the United States total.

The state's peak of expansion was reached shortly after 1900, a year which saw the establishment of nineteen new textile mills. The number of spindles had doubled between 1900 and 1904, and the state's share in total spindles rose from 7.5% to 12.4%. By 1905, the cotton-growing states were consuming more cotton than the New England states, and active cotton spindles increased to slightly more than half the New England total. By 1926, the South contained more than half of the active cotton spindles in the nation and was using about seventy per cent of all the cotton. Whereas just after the first World War the New England states witnessed a decline in amount of cotton used and the number of active spindles, the South continued to grow in both respects. In 1945, the cotton-growing states consumed 8,455,038 bales of cotton, more than eighty-seven per cent of the nation's total; they had seventeen million of the twenty-two million spindles in the country. South Carolina alone contained twenty-three

(*See page* 21)

Loom Bracing

By LOUIS P. BATSON, JR.

Today, more than ever, mill operators are realizing that lost production and lost time can not be regained and they are trying to get more production and better efficiency at a reduced cost. Among the ways to which mills have resorted to get these desirable factors is the bracing of looms.

These loom bracers, which are castings extending from one loom side to the other, are added to give the loom additional stability and weight, making vibration much less. With this reduced vibration, the loom speed can be increased and maintenance costs can be decreased.

The most beneficial results from these braces can be obtained only if the condition of the loom is "tip-top" in its entirety. This stands to reason. One would not expect a car to be like new if it were painted while the motor was in poor condition.

If the loom is in good condition, braces should prove profitable in that they (1) eliminate destructive vibration, preventing unnecessary wear of parts and increasing the life of the loom; (2) enable the loom speed to be increased; (3) reduce mechanical breakdown and loom fixing, giving fixers more time for special problems; and (4) add strength to the crankshaft through extra bearings or crankshaft boxes.

It has been found that braces prove most efficient on E model looms. However, they are available for all types of looms and are coming out on the newer looms of the X family.

In various cases, it has been found unsatisfactory to increase loom speeds, depending upon the previous speed of the loom and the type of goods being woven. Supply costs would probably go up in a proportionate amount to the increased speed. If the loom speed is not increased, the reduced mechanical breakdown and the increase in the quality of the fabric woven would pay for the cost of these braces in a short time.

Only two concerns at present have done any extensive work on bracing looms and all of it has been done in the last five years. Both companies sell their products for less than two hundred dollars.

It would not be necessary to make any changes in the duties of the loom fixer by adding these braces to the looms. The only possible addition of labor that would be encountered would be the addition of an extra warp-change man and a battery filler. This may be necessary due to the loom speed increase.

The application of loom braces is an illustration of how mill men and engineers have turned stumbling blocks into stepping stones to success.

Who's Who

John T. Wigington, 1923 Clemson graduate in Textile Engineering, was recently named in the Tenth Anniversary edition of "Who's Who in Commerce and Industry." He is presently located at Clemson as Director of the Division of Technical Service of the Cotton-Textile Institute, Inc.

Upon his graduation from Clemson, Mr. Wigington accepted a position with the Ware Shoals Manufacturing Co. In 1924, he was made superintendent of the Lonsdale Company at Seneca. Two years later, he returned to Clemson to conduct cotton fiber and spinning research for the United States Department of Agriculture. In 1928, he became research engineer for the Textile Bag Manufacturing Association in Chicago.

Mr. Wigington was with the Department of Agriculture in Washington as a cotton technologist from 1929 to 1934. After serving a short while as superintendent of the Edna Mills at Reidsville, North Carolina, he returned to Clemson with the Department of Agriculture, where he remained until 1940. At that time, he was placed in charge of the Department's Cotton Spinning Laboratory at College Station, Texas.

Since 1941 Mr. Wigington has been associated with the Cotton-Textile Institute. He is a member of the Arkwrights, Inc., American Society for Testing Materials, American Association of Textile Chemists and Colorists, Industrial Fiber Society, Rotary International, Phi Psi Fraternity, and the Masons. He has been the contributer of numerous articles to professional journals, and several of his articles have appeared in *The Bobbin and Beaker*.

Professor Thomas A. Campbell, Jr., explains the principles of doubling and drafting to a class of students in the Cards and Drawing Frames laboratory.

PROGRESS IN BLEACHING

(*Continued from page* 11)

fore was only a semi-continuous or batch process. If fairly heavy goods are to be handled, especially if high absorbency is important, the preliminary kier boil under pressure for several hours is necessary before the actual peroxide bleach. Since this bleach also requires additional hours in a kier, peroxides have until recently offered little toward time saving over the chlorine derivatives. In the field of light weight goods and especially those with colored effects, however, it is possible with proper handling to eliminate the preliminary kier or caustic boil and obtain satisfactory results in a one-step process. This one-step method consists of bleaching in the kier for 6 to 8 hours in a mildly alkaline peroxide solution at about 180 degrees F. and then completing the treatment by rinsing thoroughly. Antichloring of course is not necessary after using peroxide as it is with hypochlorites.

As may be readily seen in both the chlorine and peroxide processes the chief time bottleneck has been the kier. Its use requires time to load and unload several tons of cloth in addition to the long hours of treatment with alkali or peroxide while in the kier. In addition the processor of extra heavy cotton goods, such as ducks, must use a yet slower method of boiling out. These very heavy goods will not stand the packing of several tons into kiers without the formation of permanent crush marks or creases, and have to be handled in open width on jigs. Since a jig will handle only a small yardage, the boiling was a slow expensive step.

Considering high speed production as the ultimate aim of all American manufacturing methods, several steps have been taken in this direction for bleaching processes in recent years. First a continuous boil-out for the heavier cotton goods was developed. The cloth is wound in open width into rolls and the rolls set up in open tanks. In operation the goods are wound slowly on to a second roller passing through hot alkali as they are drawn forward. The operation of passing from roller to roller may be repeated as many times as necessary as the cloth travels the length of the boil-out tank, and approximately two hours are required before the material is ready for the bleaching step. This bleaching may be done with either peroxide or chlorine compounds.

Another step toward streamlining the bleaching operation, has been the idea of continuous steaming to eliminate the kier or jig boil-out. The goods are first passed through a padder containing hot caustic soda, and then into a steam tight chamber at a speed which permits exposure to steam for 30 to 45 minutes depending upon the construction and moteness of the cloth. After steaming, the goods are rinsed and bleached with either peroxide or chlorine compounds. The steamer itself may be used for any of the hot bleaching methods.

The most integrated continuous processes of bleaching yet developed are two methods using peroxide. These have only been fully perfected during the recent war and since they are similar in principle will be outlined as one. In these processes, kiers are replaced by two J-boxes or Gant pilers which are tremendous J shaped bins built of smooth stainless steel and carefully insulated with magnesia and rock wool, or similar materials, in order to hold the goods at a uniformly high temperature. Before entering the first of these giant bins, the goods are treated in a saturator with caustic soda. They are then pulled along through the Gant box at a speed which permits each yard to remain in the box for the space of an hour. A temperature of approximately 200 degrees F. is maintained throughout the passage through this slack piler. After the piler treatment, the goods are rinsed, saturated with alkaline peroxide solution, taken through a second Gant piler treatment similar to the first, and after rinsing again emerge fully bleached. Some of these continuous systems have been set up to handle goods in the rope form, and others adapted for goods which must be treated in open width.

Viewing the bleaching situation as of today, we find two major processes in use: the semi-continuous, using the kier method, and the continuous method just described. In practice it has been found that there is not a great deal of difference in the cost of bleaching by the two methods. The continuous process gives high speed production, but requires rather expensive mechanical equipment, such as the heavy stainless steel J-boxes. The machines required for the kier method may be of much cheaper materials throughout and if hypochlorites are used the cost per pound for the bleaching agent is materially lower.

In a final backward look, we see that while we have made tremendous strides in saving time, we are perhaps even yet not too far ahead of the bleachers of the past. The principle of bleaching remains the same. We still employ alkali for removal of pectic matter from our cellulose fibers, and still use the same whitening agent that the old bleacher used. Of course this agent is now in convenient, concentrated forms, but is nevertheless oxygen and its action as a bleach is the same as when used in the slow acting form found in the atmosphere. We rush these days to make more white shirts, sheets and handkerchiefs, but the bleacher doesn't have the winter off.

GRADUATE WORK NEEDED

(*Continued from page* 3)

lems of textiles is dependent upon the mastery of education relating to the properties and uses of these products, it seems inevitable that courses in mathematics, physics, chemistry, botany, economics, and applied textiles are obligatory. In fact these courses offer the only way to a worthy master's degree in textiles. All along the line of educational progress men will profit by cultivating the esthetic qualities to the end that they may fully appreciate the art of understanding, working with, and leading others. These qualities one must acquire by observation, study, and practice.

PHI PSI

Iota Chapter of Phi Psi initiated eleven ranking textile students last November. Left to right, front row—R. R. Crowther, R. B. Willey, J. F. Webster, L. S. Croxton, R. E. Christenberry; back row—H. R. Valerius, Jr., J. C. Austell, L. F. McMakin, G. P. Robinson, and M. D. Heaton. Not pictured is W. C. Whitten.

GRADUATES

The chapter recently lost nine members by graduation at the end of the last semester. They are W. B. Greyard, Jr., who served as Senior Warden, T. E. Christenberry, Jr., J. W. Davis, W. M. Greer, J. B, Rhame, F. C. Rogers, Jr., T. A. Turner, Jr., and D, W, Walker,

F. C. Rogers is still at Clemson, but is now serving the school as Instructor in Textiles.

ANNIVERSARY

The twentieth anniversary of the chartering of Iota Chapter at Clemson will be observed this May. Phi Psi has the honor of being the oldest established fraternity on the campus, the local charter having been granted May 18, 1927.

Professor Dan P. Thomson, Assistant Professor of Carding and Spinning here at Clemson, i sa charter member of Iota Chapter.

NATIONAL CONVENTION

Plans are being made by the chapter to be well represented at the National Convention, the first to be held by the fraternity in six years, at the Hotel Charlotte, Charlotte, N. C., May 2-4. The convention is sponsored by the National Grand Council and the Alumni Chapter of Charlotte.

Iota Chapter is presently engaged in preparing an exhibit to be on display at the convention. This exhibit, which will represent some of the work being done by members of the fraternity, will be entered in the contest which is sponsored by the Grand Council. An award for the best exhibit will be given.

Iota President E. T. McIlwain asks that as many alumni as possible to make plans to attend the convention. Information about the convention may be obtained from J. V. Killheffer, E. I. DuPont de Nemours & Co., Charlotte.

Faculty Notes

Frank C. Rogers, Jr., and Harold B. Wilson were recently named to the Textile School Faculty, according to Dean Hugh M. Brown. At the same time, M. D. Moore, Jr., resigned to accept a position in industry.

M. D. Moore is now employed by Riverdale Mills, Enoree, South Carolina, to do research, testing and costing work. He served as Instructor in Textiles from July 1946 to February 1947 here at Clemson. While teaching at Clemson, "Doc" was faculty adviser for *The Bobbin and Beaker*. Before leaving, he expressed hopes of returning to Clemson in the near future.

HAROLD B. WILSON

Professor Harold B. Wilson received his B. S. degree in Textiles from Clemson in 1941. He was admitted to the faculty of the Textile School in February as Assistant Professor in Textiles.

Immediately upon his graduation from Clemson, Professor Wilson worked in Abbeville Mills for six months. He then accepted a position as Government inspector, and over a period of four and a half years worked in twenty-six textile mills. He was then employed by the Jackson Mills in Iva, South Carolina, before coming to Clemson to work for Mr. H. H. Willis as textile consultant. Professor Wilson has worked throughout the mill, but primarily he has worked with carding and spinning.

While a student at Clemson, Professor Wilson was a member of "The Tiger" staff and was "Oscar" his senior year. He was also a member of the Calhoun Forensic Society.

CLAUDE B. ILER

Claude Bartow Iler, Southern Manager of the Keever Starch Company, died February 18 at St. Francis Hospital in Greenville at the age of 52. He was a native of Piedmont, South Carolina, but spent most of his life in Greenville.

Mr. "Pip" Iler, as he was known, was a 1915 Clemson graduate in Mechanical and Electrical Engineering. While at Clemson he was a letterman in baseball. He served in World War I as a lieutenant on the Mexican border.

For a quarter of a century, he was associated with the Keever Starch Company, serving for the past seven years as Southern Manager. Mr. Iler was widely known and highly respected by men of the textile industry in the South.

FRANK C. ROGERS, JR.

Professor Rogers, member of the class of 1944, received his B. S. degree in Textile Engineering from Clemson in 1947. He accepted an appointment to the faculty of the Textile School as Instructor in Textiles.

While at Clemson, Professor Rogers was a member of Phi Psi and Mu Beta Psi fraternities. During the period between 1943 and 1946, Professor Rogers served in the United States Army, seeing active duty in the Philippine Campaign. He was discharged with the rank of First Lieutenant.

TEXTILE SCHOLARSHIPS

(*Continued from page* 12)

Mr. and Mrs. Elliott Springs have announced the establishment of a scholarship fund in memory of their son, Leroy Springs II, and his grandfather, Leroy Springs. The announcement of this fund was made last summer.

According to the "Springs Bulletin", "The funds will be available to provide both loan scholarships and paid scholarships, for both boys and girls.

"The loan scholarships will be awarded to boys and girls of scholastic ability and good character who show a financial need. They are giving preference to graduates of the High Schools in Lancaster, Fort Mill, Chester and Kershaw who have met the entrance requirements for the Textile Course at Clemson, Georgia Tech, or North Carolina State, or the Business Course at Winthrop.

"The amount and terms of the loans will be determined by the individual needs. All repayments will be used for other loans, thus establishing a permanent program with a revolving fund.

"The paid scholarships will be awarded to those who have held loan-scholarships for two or more years and who make the necessary scholastic records."

This fund is similar to the Pendleton scholarship in that it requires the student to take a prescribed course of study. At the present time, there are no students enrolled at Clemson under the terms of this scholarship fund.

These textile concerns see the definite need for greater educational opportunities in the textile communities and have taken positive steps to raise the educational standards of the respective communities by establishing these scholarships. Not only are deserving students given the opportunity to get a college education, but also the students are encouraged to do much better work through competition for the scholarships.

GOVERNMENT SPINNING LABORATORY

(*Continued from page* 8)

"The variable speed drive permits the slashing of yarn at speeds ranging from approximately four to 23 yards per minute. Through the use of this speed drive, and a thermostat in the drying compartment, it is possible to obtain the degree of drying necessary for any count of yarn. The amount of sizing on the warp may be controlled within limits by varying the pressure on the squeeze rolls.

"A pre-determining revolution counter is mounted on the beam carriage for the purpose of stopping the machine when the desired yardage has been run into any beam section. This counter is a standard commercial product and may be set at the beginning of a warp so that the machine will stop when the desired yardage is on the beam. The counter is turned back to '0' yardage before starting to run yarn into any section of the beam . . . The machine has been used to slash samples as small as 1 1-4 pounds of 21s yarn, from which a sufficient quantity of cloth was woven for testing."

There are still many problems arising in the textile field which require extensive research work. In many of these problems, the Government laboratory and Mr. Cook will play a major part in the future.

A. A. Schneider, Textile Engineering senior from Patterson, New Jersey, perform the duties of a warp tender as he lays the warp ends into a special comb on the front of a warper.

J. B. Rhame (left) February graduate in Textile Engineering, learns from mechanic John Willis the proper method of lacing design cards for a Jacquard loom.

(*Continued from page 15*)

per cent of the nation's total and was consuming almost two million of the nation's nine and a half million bales of cotton. The state was second only to North Carolina in total cotton spindles in place and active spindle hours.

The importance to South Carolina of the cotton textile industry cannot be overestimated. Over fifteen per cent of all employed persons in the state are textile mill employees. Of persons employed in manufacturing concerns, two-thirds are textile workers.

There were 228 textile establishments in the state in 1939. All but eighteen of them were located in the Piedmont, where over ninety-six per cent of the textile workers are employed. The value of textile products was 273 million dollars, more than sixty-four per cent of the state's total for manufactured goods. Of this total, cotton broad woven goods alone amounted to 178 million and rayon broad woven goods to forty-three million dollars.

Spartanburg county ranks third in the nation in total spindles in place and is exceeded only by Gaston county, N. C., and Bristol county, Mass. Only Gaston consumes more cotton than Spartanburg, which in 1945 used 369,270 bales, 3.75% of the country's total. Anderson and Greenville counties are not far behind Spartanburg in these categories. Greenwood county, however, has the highest percentage of textile employees, with nearly one of every six persons in the county being employed in a textile plant.

During 1946, twenty-four new textile manufacturing plants and thirty new garment and sewing plants were established with an investment of almost three million dollars. The total for the state was seven and a quarter million dollars.

South Carolina's Piedmont section is now the center of the cotton textile industry in the United States and seems destined to remain as such for many years to come. The recent trend in establishing rayon mills and dyeing and finishing plants in this area will markedly increase the importance of this area to the textile industry.

Note: Most of the information for this article is taken from "The Growth and Distribution of Population in South Carolina", bulletin prepared by Julian J. Petty for the Research, Planning and Development Board, State of South Carolina, Columbia, S. C.

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TEXTILE OPPORTUNITIES

(*Continued from page* 13)

Knowles Loom Works, made a survey of their products in use. They found that 62 per cent of the looms were fifteen years old or older. During the ten years since 1937, new looms have not been on the market in sufficient quantity to supply the demand.

Now is the time when new manufacturing plants are being built and new machinery is being purchased. At this time, the woolen and worsted industry is looking for the most advantageous locations for their new plants. There are many reasons for their consideration of the South. Some of the facts for this consideration will be discussed.

The water supply of South Carolina is suitable for industrial purposes. There are four major drainage basins: Pee Dee Basin, Santee Basin, Edisto Basin, and Savannah Basin. The majority of the drainage areas are in South Carolina, and the water is generally soft with low mineral content. For many purposes no treatment is necessary prior to its use.

South Carolina offers a high rating of electric energy horsepower-per-workman. In 1940 the installed power of hydro-electric plants was approximately 80 per cent of the state's total installed power, in which the state was sixth in the nation. Electric power is a clean, efficient source of power—one which necessitates a minimum of dependability upon other sources of power. Federal Power Commission statistics show that typical industrial power bills in South Carolina are about 84 per cent of those in New England localities.

There is a slightly higher railroad rate on manufactured goods. At the present time this problem of rates is being discussed in Washington. Not only is South Carolina a convenient location for serving the increasing garment manufacturing industry, but it is also favorably located for the potential Latin American consumers.

Railroad shipping rates from the wool producing center of the United States to Boston and to Columbia, South Carolina, are the same. In normal times, more than 30 per cent of the raw wool for manufacturing in this country is shipped by water from Australia, Argentina, and the Union of South Africa. The port of Charleston is several hundred miles closer to these sources than are the Northern ports, and a water haul of about 70 miles would be offered to mills located on the upper shores of the Santee-Cooper basin.

The state is serviced by three large railroads with 6,164 miles of track. The paved highways are in excellent condition and cover over 6,550 miles. These highways are safe and suitable to carry heavy traffic to all parts of the state, and for inter-state travel. There are three deep-water ports suitable for receiving ocean going vessels, and they are connected with the intercoastal waterway. Three federal airlines schedule regular stops in South Carolina.

It may seem that, with the large amount of skilled cotton mill personnel in South Carolina, there would be a large supply of labor for woolen mills. It has been found in certain cases, however, that cotton mill workers do not do well in woolen and worsted processing because of the differences between the two manufacturing methods. It has been the experience of mills coming into this area that it is more desirable to train green labor. This would not mean a great loss of time and money because lower wages would be paid to the employees while learning. With increased efficiency, wages would be augmented, and production would grow. Graduates of Southern textile schools would be able to adapt themselves to this type of work almost as readily as they would to the cotton textile work because of their generalized training in the fundamentals of textile processing.

Based upon figures for the fiscal year 1940-1941, the average daily wage for textile workers in South Carolina was three cents above the average wage for all industries in the state. By comparison, in both the cotton and woolen industries, the average wage paid in 1942 by the Southern cotton and wool manufacturers was approximately 80 per cent of that of the Northern worker. Although there was a slightly lower value of product per man hour in the South, this was offset by the cheaper costs and the net value of products per man hour in the South was 27.5 per cent above that of the Northern states.

Pleasant labor relations have been found in the South by amiable management. The large majority of native born workers is one of the principal factors for these desirable labor relations. It can be said, without fear of contradiction, that industry will find dependable workers and harmonious labor conditions.

The climate gives several advantages to South Carolina in industrialization. The average yearly temperature for South Carolina is 63 degrees. It is a stimulating climate, having cool nights in the summer and warm days during the winter months. This would contribute to a reduction of absenteeism and a better general physical condition of the employees.

Building costs also are reduced because of the mild climate. Saving can be effected in the initial construction in items such as the roof and the depth of foundation. With relation to mill maintenance, the minimum of cold days and the absence of long cold spells influence the kind and amount of fuel used.

South Carolina is anxious to increase the development of the woolen and worsted industry of the state. With its many natural advantages over other regions, there is no reason why this industry can not be expanded to a much greater extent.

Note: Material for this article was obtained from "An Opportunity for the Woolen and Worsted Industry in South Carolina", a bulletin prepared for the Research, Planning and Development Board, State of South Carolina, Columbia, S. C.

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INDEX TO ADVERTISERS

ANTIQUE EQUIPMENT PRESENTED

(Continued from page 9)

This "combination textile machine", embodying the essentials of the cotton gin, opener, card, and drawing frame, receives field cotton (containing both seed and trash) on its short conveyor belt on top of the machine. The cotton is fed into a hopper where a miniature gin removes most of the seed and trash together with a considerable amount of cotton. The cotton is opened and then moved on to a small card. The small card sliver passes through miniature drafting rolls and is wound as a coarse yarn on small bobbins. The machine is so geared that all parts of the machine function merely by turning a single handle.

The machine is entirely hand-made, including the fluted steel roll and other metal parts. Its exact age is not known, but it is believed to have been made between 1800 and 1830. It is said that as little as a handful of raw cotton can be converted by the machine into a coarse yarn.

One small all-wooden spinning wheel was purchased by Mr. Humbert from a Blowing Rock, North Carolina, antique dealer. This spinning wheel is reputed to date back to 1790.

The all-wooden reel, or hanker, was made by hand in Oconee county "many years ago".

The model of the bale presser was made by a Mr. Miller of Abbeville county about 1830. The model is a reproduction of one of the earliest designed pressers.

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HUNT SPREADERS ALLOW HIGHER SPEEDS....GIVE GREATER STABILITY

WEAVING PRACTICES, including "Maintenance, Cleaning, and Bracing of Looms," occupied an important place on the program of the recent fall meeting of the Textile Operating Executives of Georgia; held in Atlanta, Oct. 12th.

Bracing, characterized by Hunt Spreaders, came in for generous praise. Figures gathered from operation of many mills, as reported in COTTON, November 1946, showed that:

"60-inch E-Model looms after bracing gave 104.8% efficiency compared with unbraced looms. Speed of the braced looms averaged 149 ppm. and regular looms 125 ppm. on the same test.

"Extra bearings were placed on looms in another mill, with a smoother running loom and less trouble resulting. The looms were not speeded, but were enabled to operate on heavier goods. This change on 40-inch E-Model looms, running 160 ppm. lowered seconds and increased the production without speeding.

"Other mills also reported lower maintenance costs, and smoother operating looms by bracing.

"Other experiences were related concerning 28-inch E-Models, 40-inch E-Models and 62-inch Model D looms. The 28-inch loom speed was increased from 147 to 176 ppm.; 40-inch from 143 to 167 ppm., and the 62-inch from 128 to 149 ppm. Tests indicated that the looms ran smooth enough at these speeds."

The foregoing reports from Georgia Textile Executives are typical. Other users of Hunt Spreaders from Maine to Texas say they get better cloth, higher production, reduced vibration, lower maintenance costs, and uniformly smoother performance in weave rooms.

To learn more about the benefits you can get from an installation of Hunt Spreaders, write or wire today for detailed information.

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